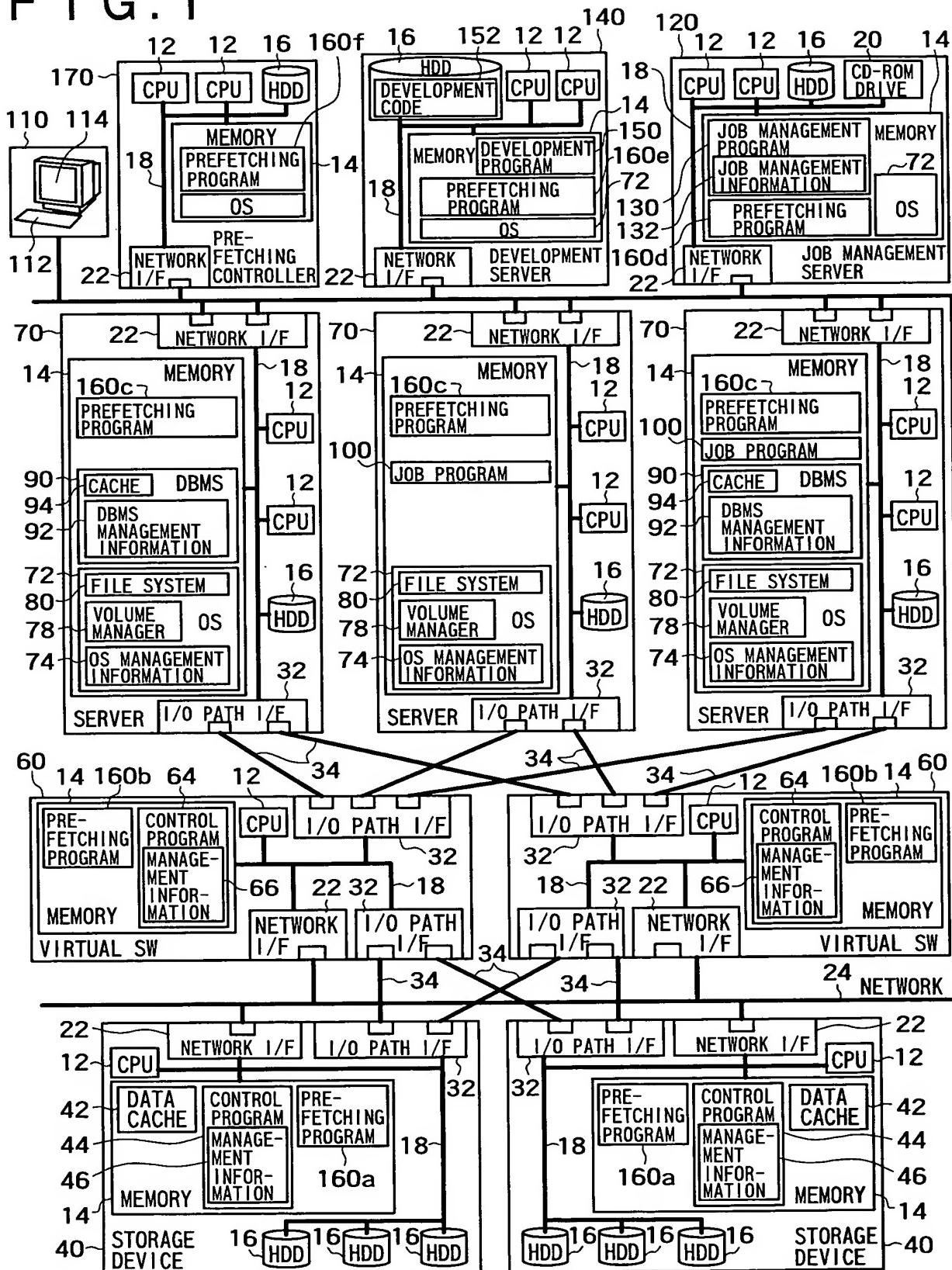
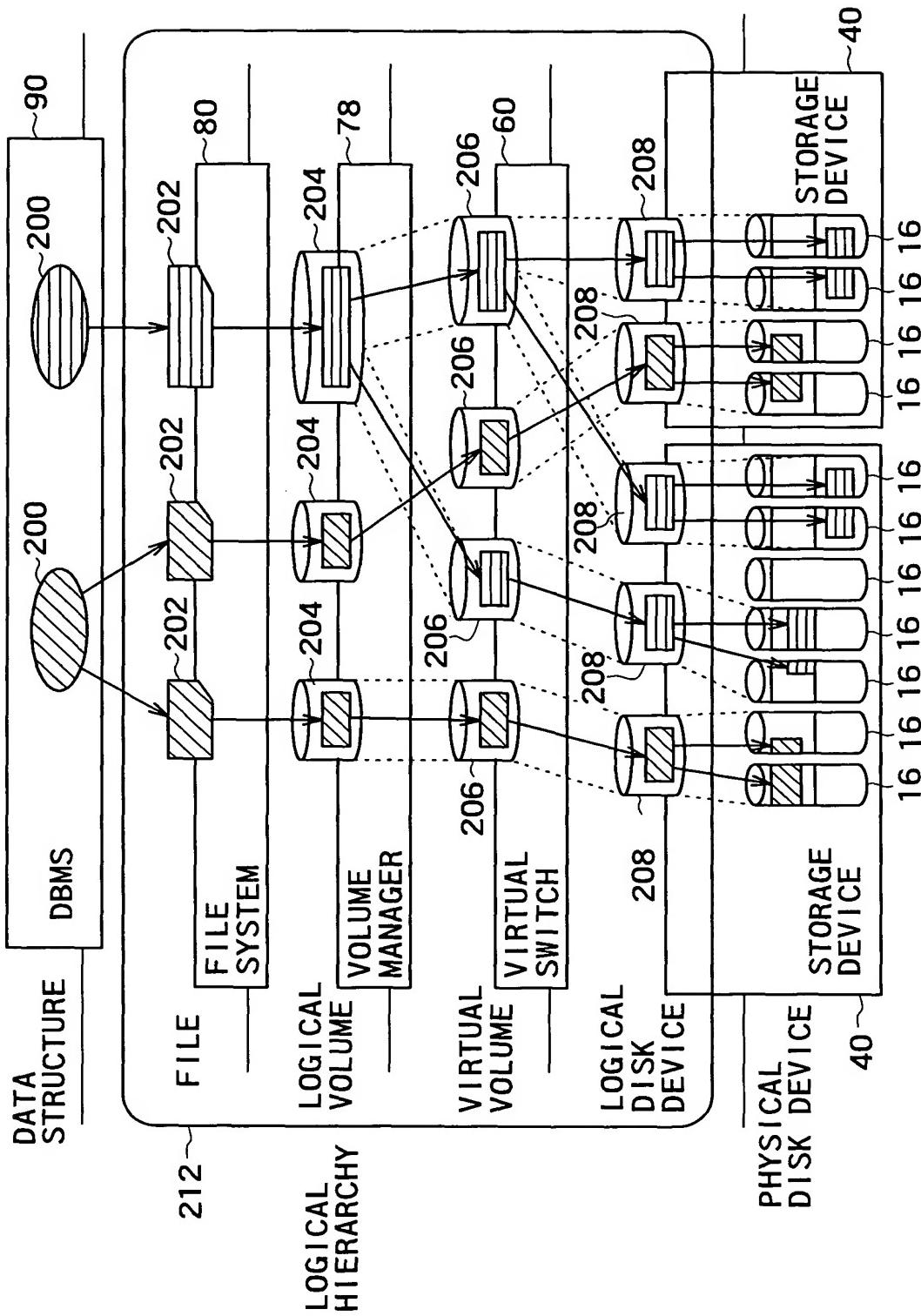


FIG. 1



F | G. 2



F | G . 3

3 / 29

AREA INFORMATION OF UPPER VIRTUAL STRUCTURE		CORRESPONDING AREA INFORMATION OF LOWER MANAGEMENT STRUCTURE			INTER- STRUCTURAL AREA	
VIRTUAL STRUCTURE ID	INTER- STRUCTURAL AREA	VIRTUALIZING MECHANISM ID	MANAGEMENT STRUCTURE ID			
Upper0	0-10239	LowApp0	Lower0	0-10239		
	10240-20479	LowApp1	Lower1	0-10239		
Upper1	0-10239	LowApp0	Lower0	10240-20479		
	10240-20479	LowApp1	Lower1	10240-20479		
Upper2	0-10239	LowApp2	Lower0	0-10239		
	10240-20479	LowApp2	Lower1	0-10239		
:	:	:	:	:	:	:

AREA MAPPING INFORMATION

FIG. 4

512                    514                    510

DATA STORAGE AREA INFORMATION		
NAME OF DATA STRUCTURE	DATA STORAGE POSITION	
	NAME OF DATA FILE PATH	BLOCK NUMBER
	/dev/rdsk/Ivol0	0-499
	/dev/rdsk/Ivol0	2000-2499
	/dev/rdsk/Ivol0	500-799
	/dev/rdsk/Ivol1	500-799
:	:	:

FIG. 5

521                    522                    524                    526

NAME OF DATA STRUCTURE	T1	T2	...
DATA PAGE SIZE	16KB	8KB	...
NUMBER OF DATA PAGES	61897	78783	...
CACHE QUANTITY	1024 PAGES	2048 PAGES	...

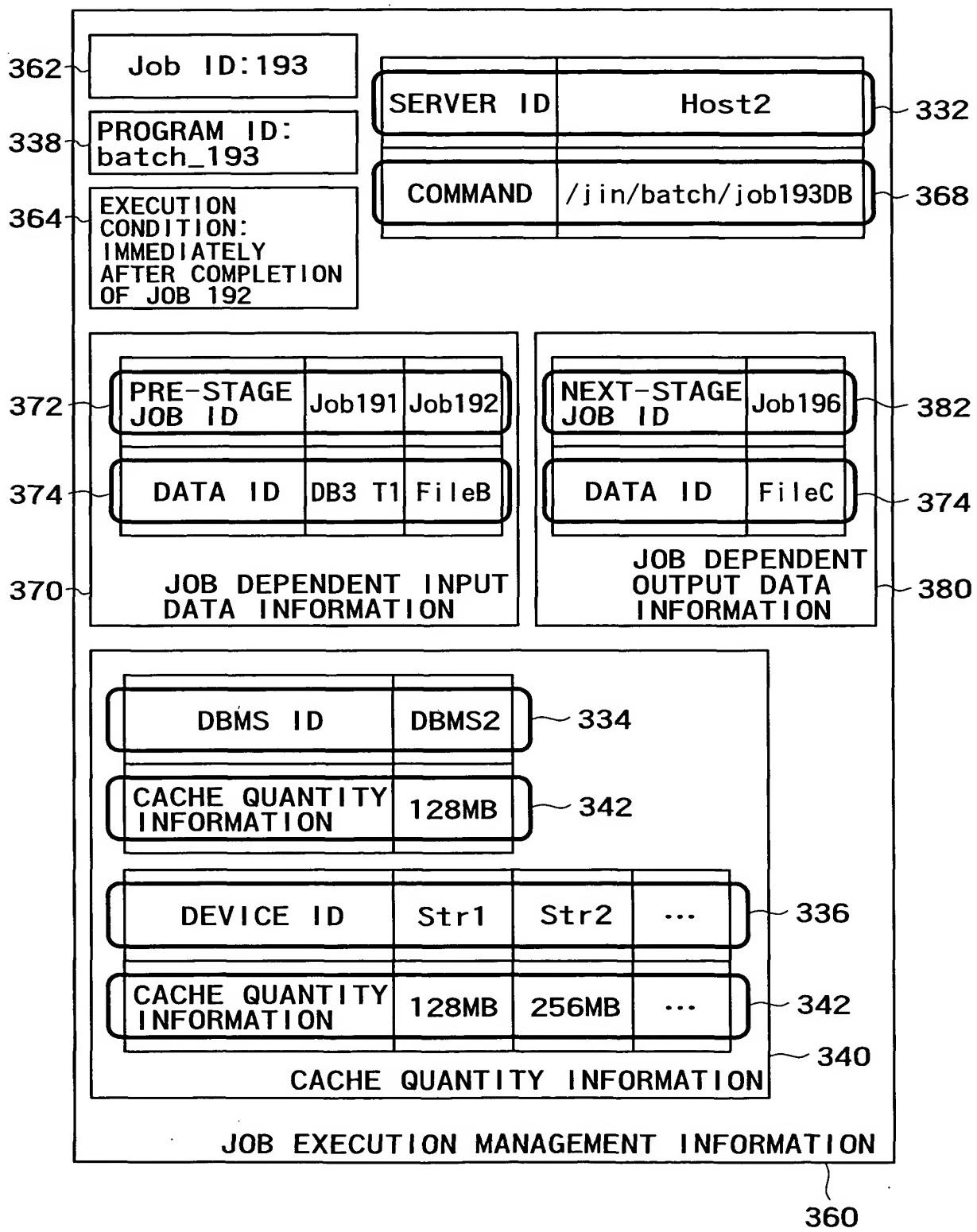
TABLE DATA QUANTITY INFORMATION

520

FIG. 6

NAME OF DATA STRUCTURE	Ind1-1	Ind2-1	...	531
NAME OF CORRESPONDING TABLE	T1	T2	...	532
TYPE OF INDEX	B-Tree	BitMap	...	534
DATA PAGE SIZE	8kB	8kB	...	533
NUMBER OF DATA PAGES	3782	6782	...	535
NUMBER OF LEAF NODE PAGES	2898	-	...	536
CACHE QUANTITY	1452 PAGES	50 PAGES	...	537
RETRIEVAL ATTRIBUTE	ID1 (ID1, ID2)	ID2	...	538
EXPECTATION TUPLE NUMBER	5.5	1	2058.2	...
				530
			INDEX INFORMATION	

FIG. 7



**FIG. 8**

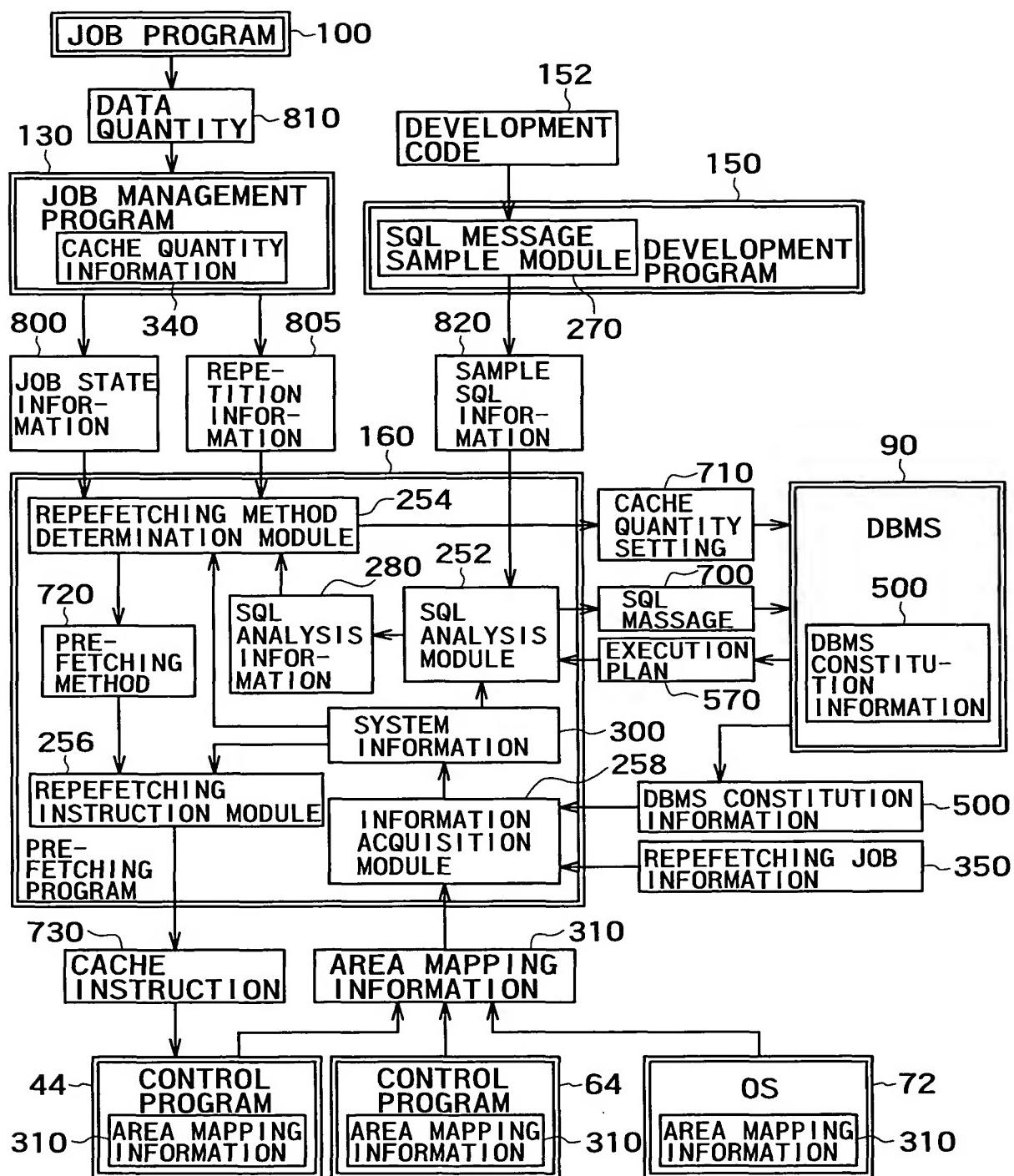
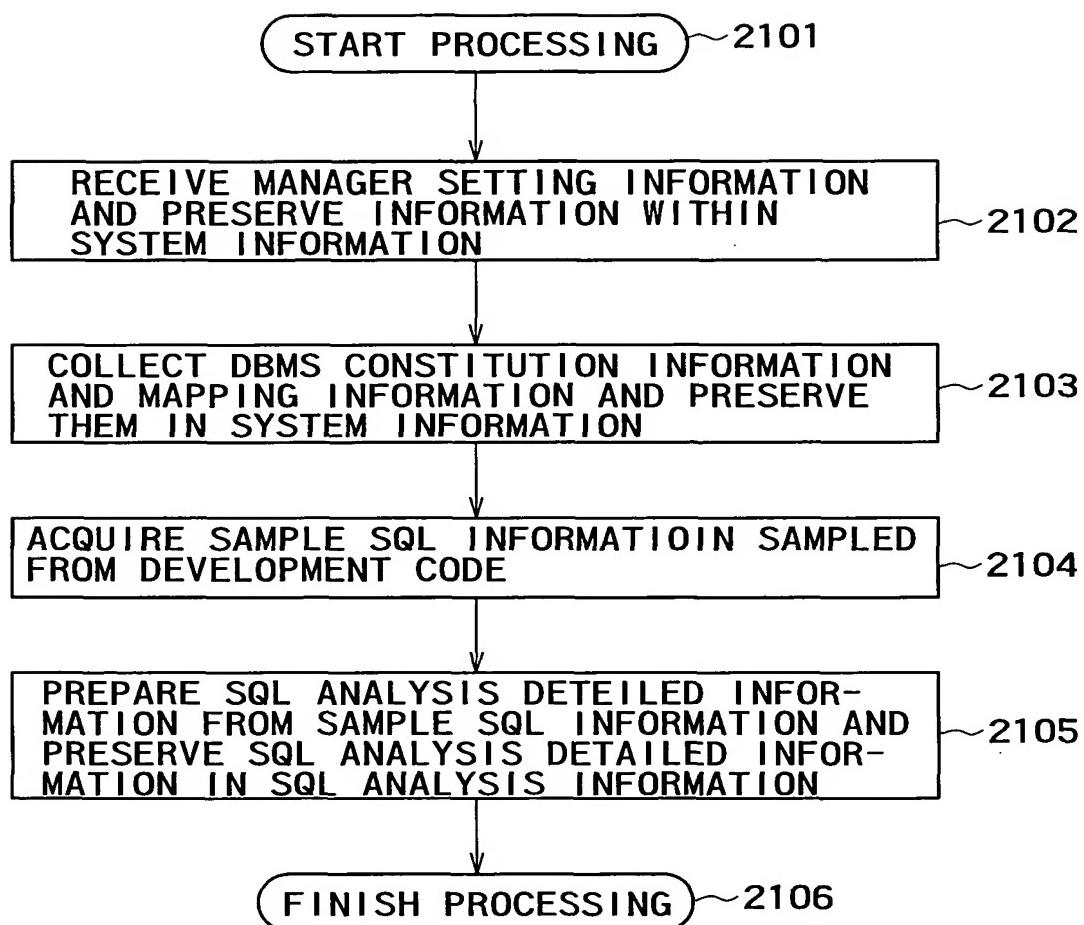
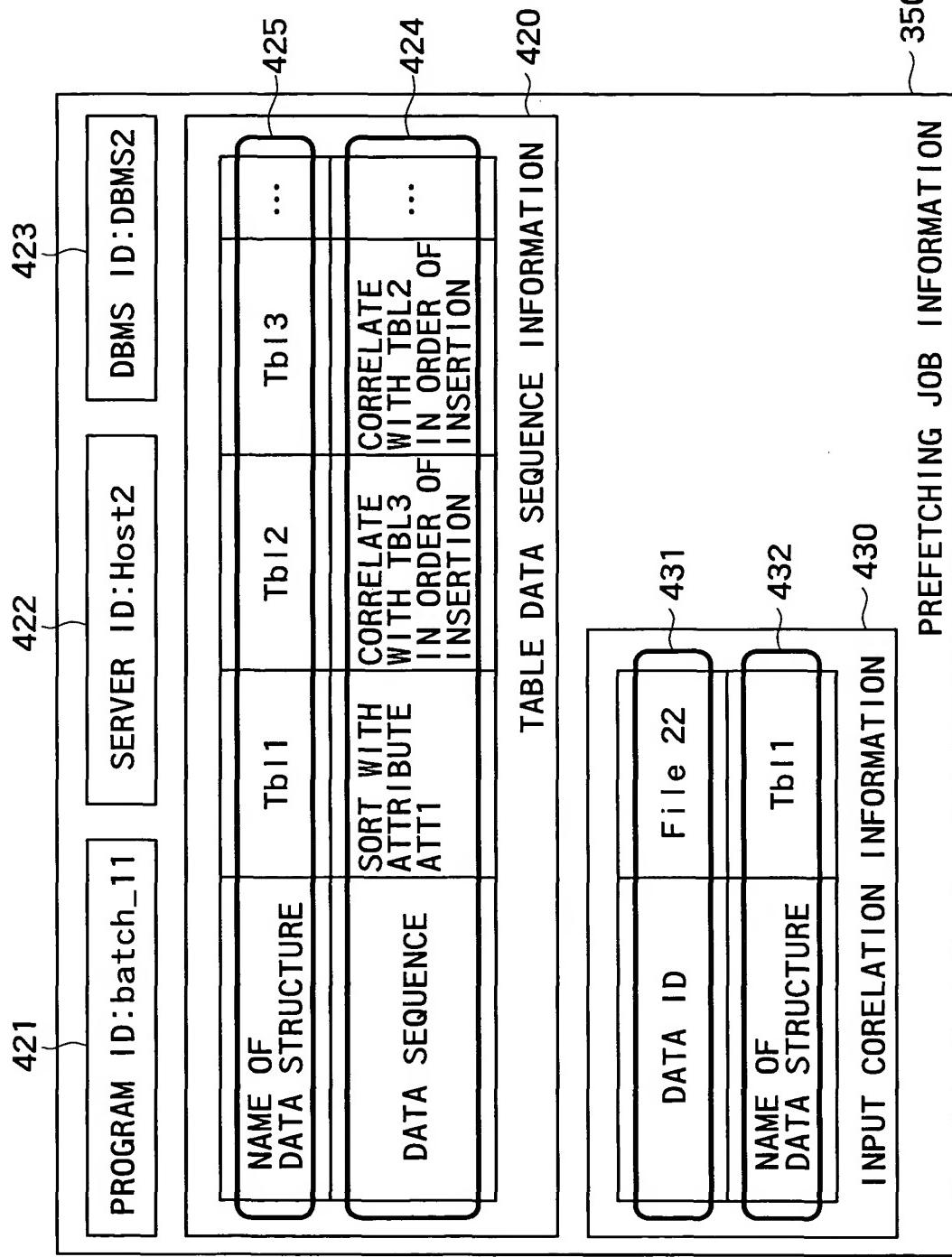


FIG. 9



**F I G. 1 0**



10/29

# F I G. 1 1

```
...
for(i=0; i<records; i++) {
...
name=in_name[i]; addr=in_addr[i]; pay=i[i];
EXEC SQL SELECT C_ID,C_ID INTO:c_id,:c_d_id
  FROM Cust
 WHERE C_Name=:name and C_Addr=addr
 FOR UPDATE;
...
EXEC SQL UPDATE Cust
  SET C_Balance=C_Balance-:pay
 WHERE C_ID=:c_id;
...
COMMIT;
}
```

~5002

```
...
  SAMPLING PROCESSING
...
HINT REPEAT START LABEL(L_records_1) ~5012
SELECT C_ID,C_ID
  FROM Cust
 WHERE C_Name=:name and C_Addr=addr
 FOR UPDATE;

UPDATE Cust
  SET C_Balance=C_Balance-:pay
 WHERE C_ID=:c_id;
...
COMMIT;

HINT REPEAT END; ~5018 ~5000
...

```

5014

5012

5010

5000

## FIG. 12

```
DECLARE Tname_cursor CURSOR FOR
  SELECT name
  FROM Objects
  WHERE type=TABLE;
```

~5102

```
FOREACH record IN Tname_cursor
BEGIN
```

```
  SELECT name,size
  FROM Tables
  WHERE name=record.name;
```

~5106

END;

~5104

SAMPLING PROCESSING

5014

```
HINT REPEAT START LABEL( L_Tname_cursor );
```

5012

```
  SELECT name,size
  FROM Tables
  WHERE name=record.name;
```

~5110

```
  HINT REPEAT END;
```

~5018

5100

FIG. 13

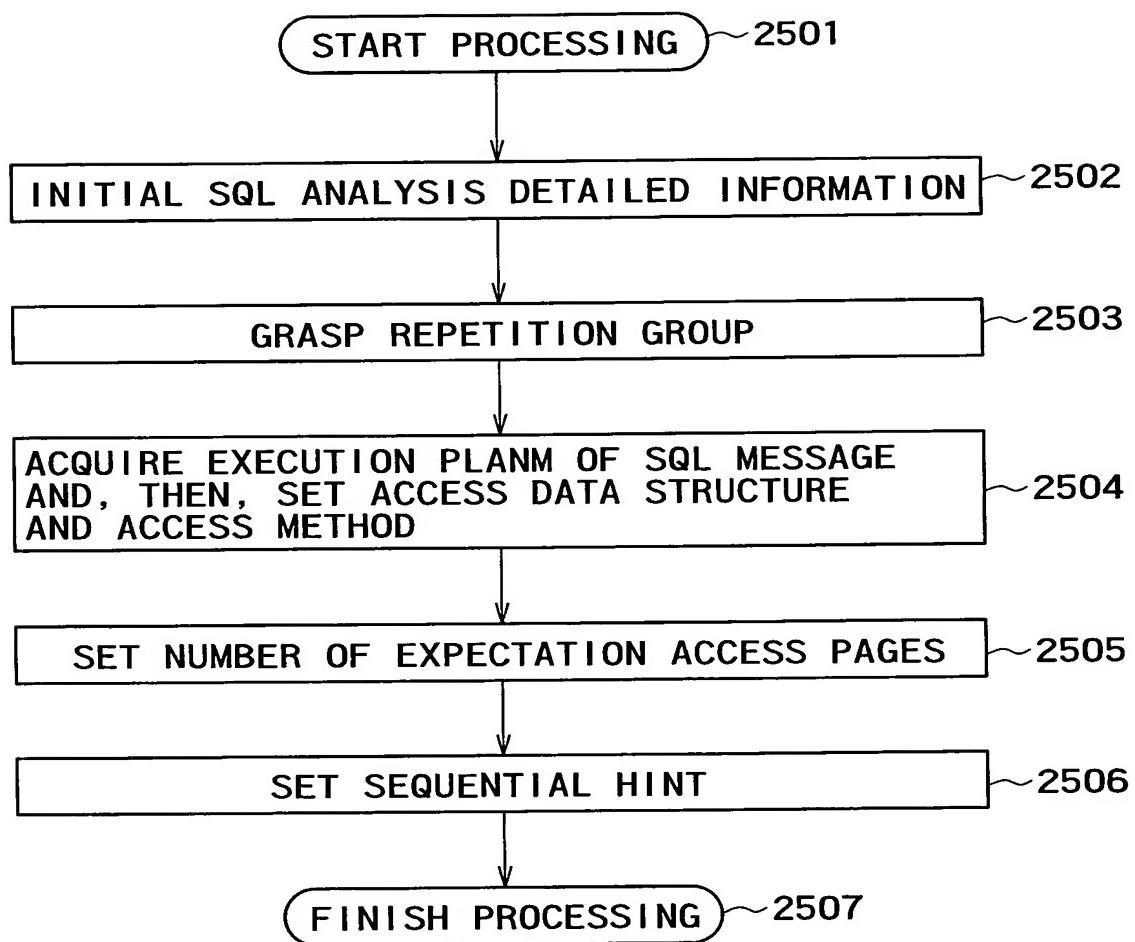


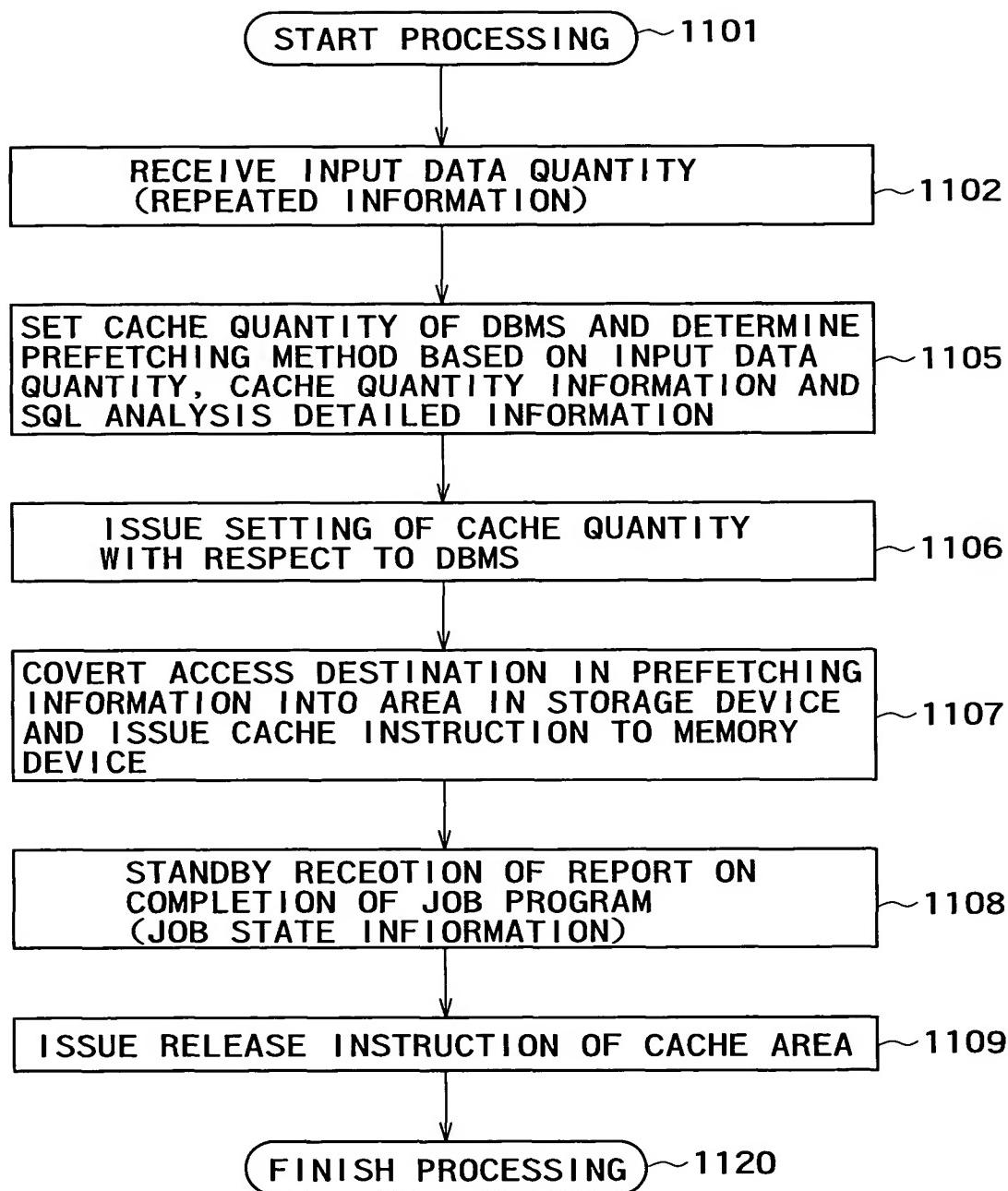
FIG. 14

PROGRAM ID:batch_11	DBMS ID:DBMS3	~291
REPETITION GROUP ID	L_loop_1	282
ORDER OF EXECUTION	1	284
DRIVE DATA ID	DB8 T1	286
NAME OF DATA STRUCTURE	T1	Ind-2-1
ACCESS METHOD	Table Access Full	Index Access
NUMBER OF EXECUTION ACCESS PAGE	-	4.5
SEQUENTIAL HINT	Y	-
		~290
		SQL ANALYSIS DETAILED INFORMATION

**F | G . 1 5**

NAME OF PARENT NODE		CONTENT OF NODE PROCESSING		ACCESS DATA STRUCTURE		DETAIL OF NODE PROCESSING		EXECUTION PLAN	
N-1-1	root	Sum	-	-	-	Sum(T1,B)	-	-	-
N-2-1	N-1-1	Nested Loop Join	-	-	-	T1, Key1=T3, Key1	-	-	-
N-3-1	N-2-1	Hash Join	-	-	-	T3, Key3=T4, Key4	-	-	-
N-3-2	N-2-1	Table Access by Index	T1	-	-	-	-	-	-
N-4-1	N-3-1	Table Access Full	T3	-	-	-	-	-	-
N-4-2	N-3-1	Filter	-	-	-	T4, M < 100	-	-	-
N-4-3	N-3-2	Index Access	Ind1-1	Key1=[RESULT OF N-3-1]	-	-	-	-	-
N-5-1	N-4-2	Table Access Full	T4	-	-	-	-	-	-

FIG. 16



16/29

F I G . 1 7

NAME OF DATA STRUCTURE	T1	T2	...
CACHE QUANTITY	1024 PAGES	2048 PAGES	...

SETTING OF CACHE QUANTITY

711  
712  
710

F I G . 1 8

NAME OF DATA STRUCTURE	T1	Ind2-1	...
CACHE METHOD	SEQUENTIAL	INSTANT PREFETCHING	...
DRIVE ID	Str2	Str1	...
CACHE QUANTITY	4MB	40MB	...
ACCESS ORDER	1	2	...

PREFETCHING METHOD

721  
722  
723  
724  
725  
720

FIG. 19

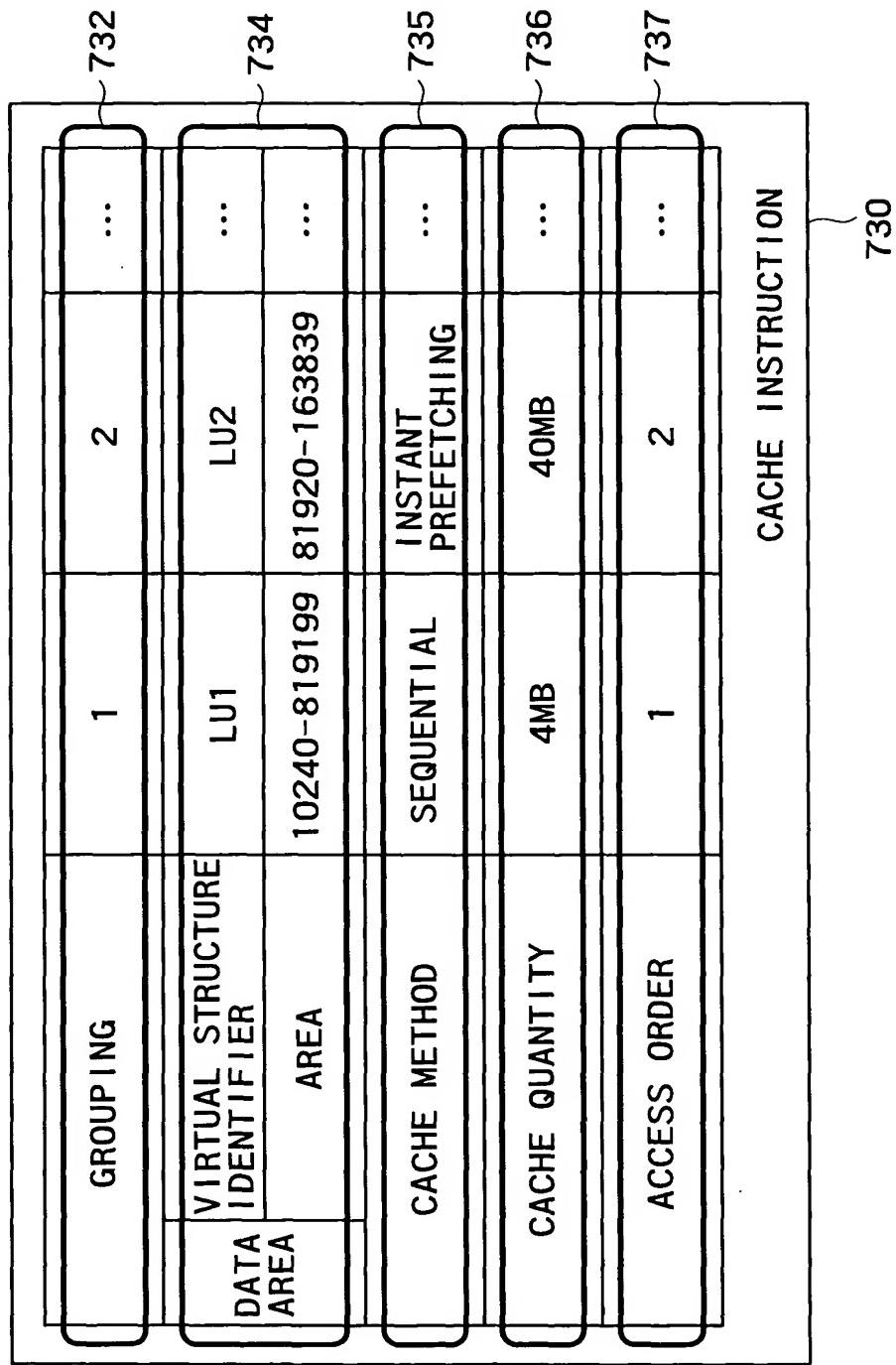


FIG. 20

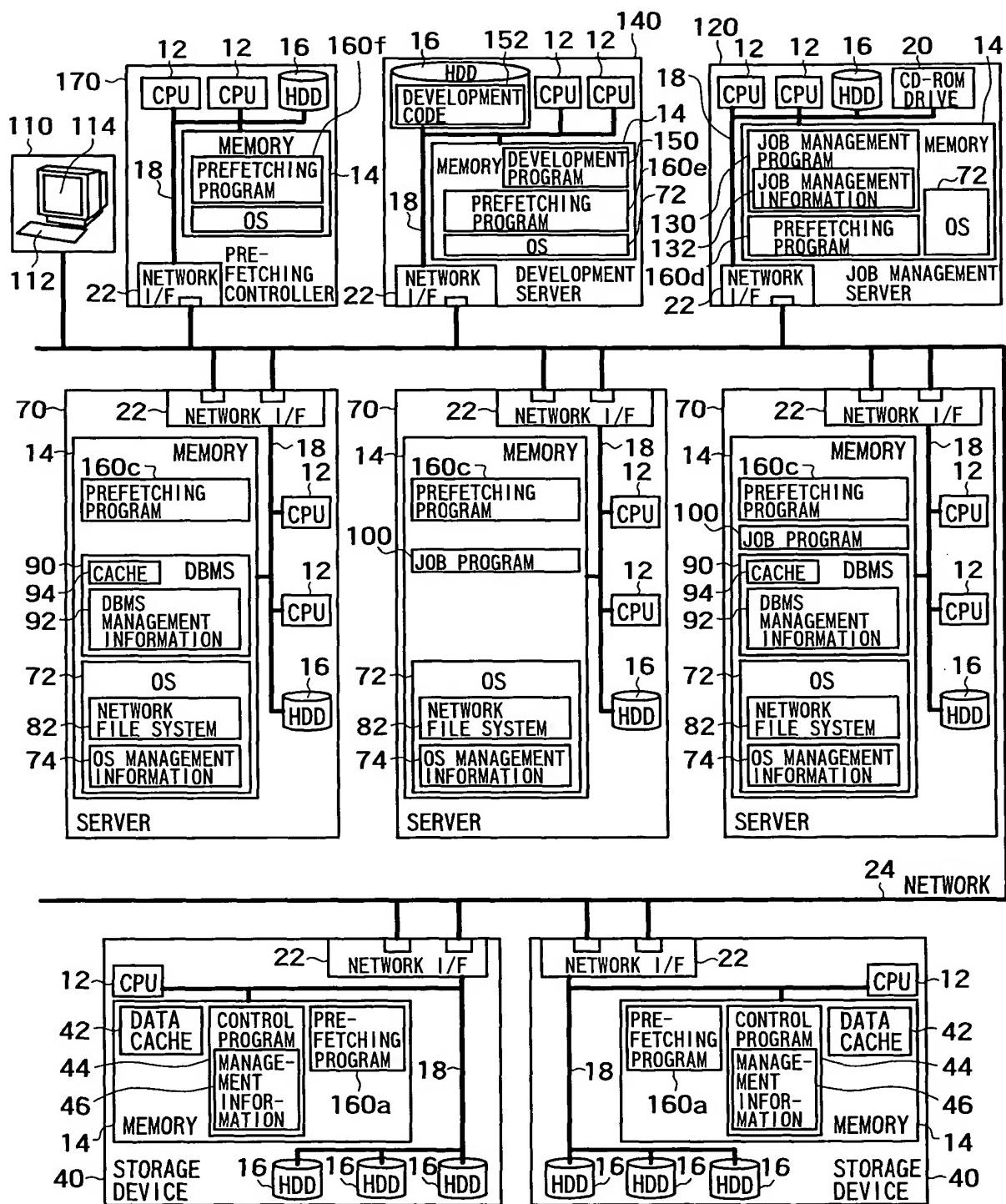


FIG. 21

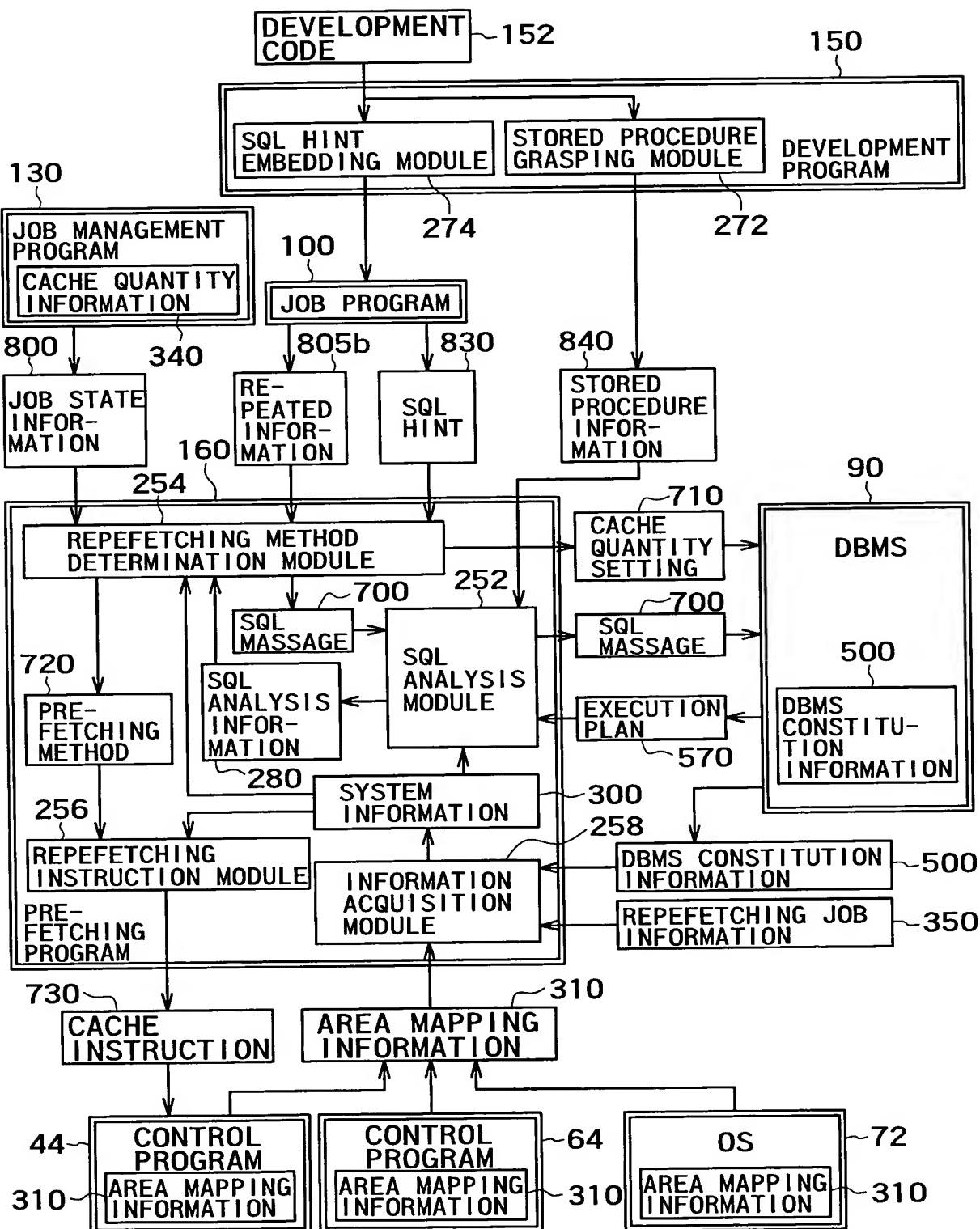
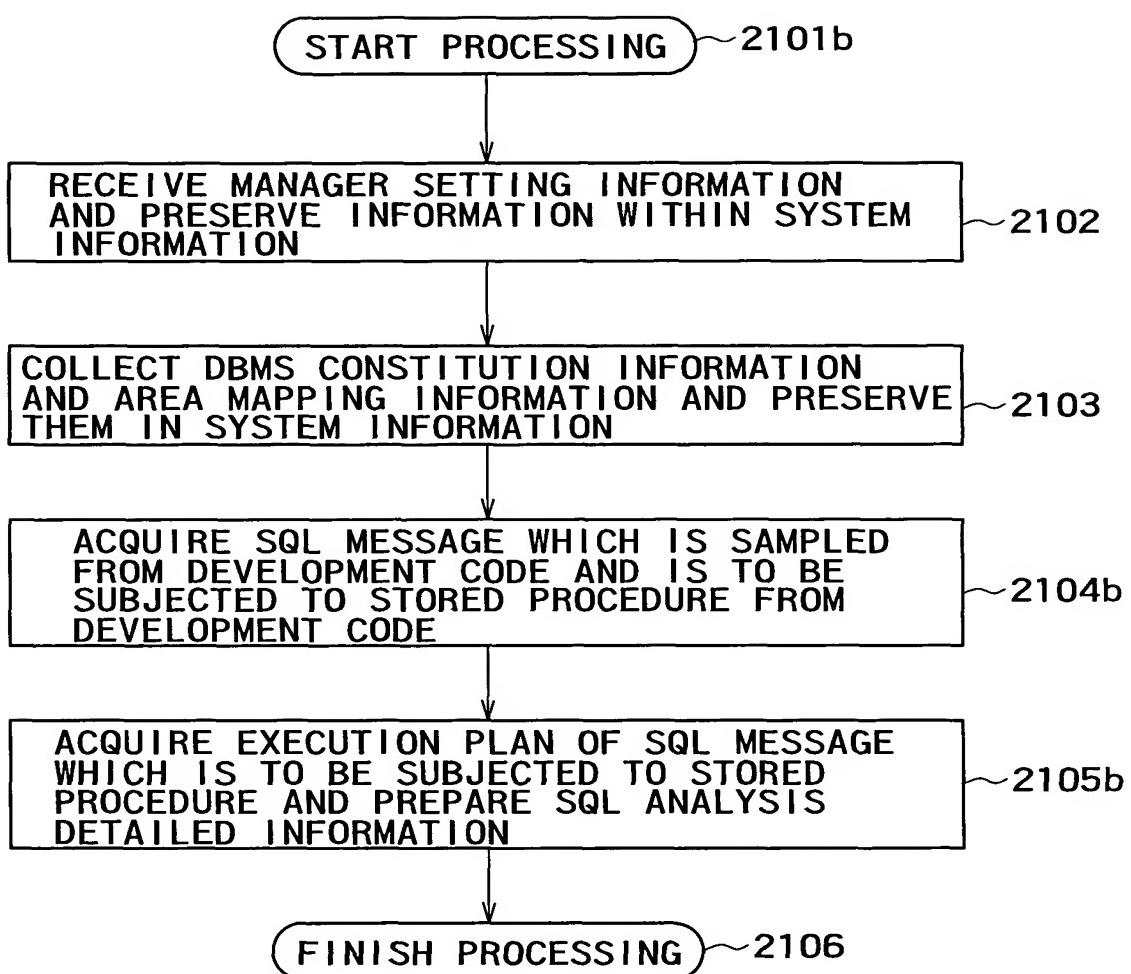


FIG. 22



# F | G. 23

5202

CREATE PROCEDURE **(proc\_pay)** (IN name, IN address, IN pay)

BEGIN

DECLARE c\_id NUMBER(10);

DECLARE c\_d\_id NUMBER(10);

SELECT c\_id,c\_id INTO:c\_id,d\_id  
FROM Cust  
WHERE C\_Name=:name and C\_Addr=addr  
FOR UPDATE;

UPDATE Cust

SET C\_Balance=C\_Balance-pay

WHERE C\_ID=c\_id;

...

COMMIT;

END

~5200

## F | G. 24

PROGRAM ID:batch_11	DBMS ID:DBMS3	291
NAME OF STORED PROCEDURE:proc_pay		298
SQL MESSAGE TO BE ANALYZED; CREATE PROCEDURE proc_pay (IN name, IN address, IN pay) BEGIN ... COMMIT; END		296
ACCESS METHOD	Table Access Full Index Access	288
NAME OF DATA STRUCTURE	T1	Ind2-1 ... 287
NUMBER OF EXPECTATION ACCESS PAGE	-	4.5 ... 292
SEQUENTIAL HINT	Y	- ... 294
SQL ANALYSIS DETAILED INFORMATION		290b

```

...
for(i=0; i<records; i++) {
...
name=in_name[i]; addr=in_addr[i]; pay=i[i];
EXEC SQL SELECT C_ID,C_ID INTO:c_id,:c_d_id
  FROM Cust
  WHERE C_Name=:name and C_Addr=:addr
  FOR UPDATE;
EXEC SQL UPDATE Cust
  SET C_Balance=C_Balance-:pay
  WHERE C_ID=:c_id;
...
COMMIT;
}

... HINT EMBEDDING PROCESSING ~5024
...
EXEC SQL HINT REPEAT START COUNT ;records; ~5022
EXEC SQL HINT EXEC_SQL
" SELECT C_ID,C_ID
  FROM Cust
  WHERE C_Name=dummy1 and C_Addr=dummy2
  FOR UPDATE;
...
COMMIT;

for(i=0; i<records; i++) {
...
name=in_name[i]; addr=in_addr[i]; pay=i[i];
EXEC SQL SELECT C_ID,C_ID INTO:c_id,:c_d_id
  FROM Cust
  WHERE C_Name=:name and C_Addr=:addr
  FOR UPDATE;
EXEC SQL UPDATE Cust
  SET C_Balance=C_Balance-:pay
  WHERE C_ID=:c_id;
...
COMMIT;
}

EXEC SQL HINT REPEAT END; ~5028
...

```

## FIG.26

```
DECLARE Tname_cursor CURSOR FOR
  SELECT name
    FROM Objects
   WHERE type=TABLE;
```

~5102

```
FOREACH record IN Tname_cursor
BEGIN
  SELECT name,size
    FROM Tables
   WHERE name=record.name;
END;
```

~5104

```
SELECT name,size
  FROM Tables
 WHERE name=record.name;
```

~5106

HINT EMBEDDING  
PROCESSING

```
DECLARE Tname_cursor CURSOR FOR
  SELECT name
    FROM Objects
   WHERE type=TABLE;
```

~5102

```
HINT REPEAT START
```

```
COUNT( SELECT count(name)
      FROM Objects
     WHERE type=TABLE );
```

~5024b

~5022b

```
EXEC SQL HINT EXEC_SQL
```

```
" SELECT name,size
      FROM Tables
     WHERE name=record.name; "
```

~5110

~5026b

```
FOREACH record IN Tname_cursor
BEGIN
  SELECT name,size
    FROM Tables
   WHERE name=record.name;
END;
```

~5104

```
HINT REPEAT END; }
```

~5028

FIG. 27

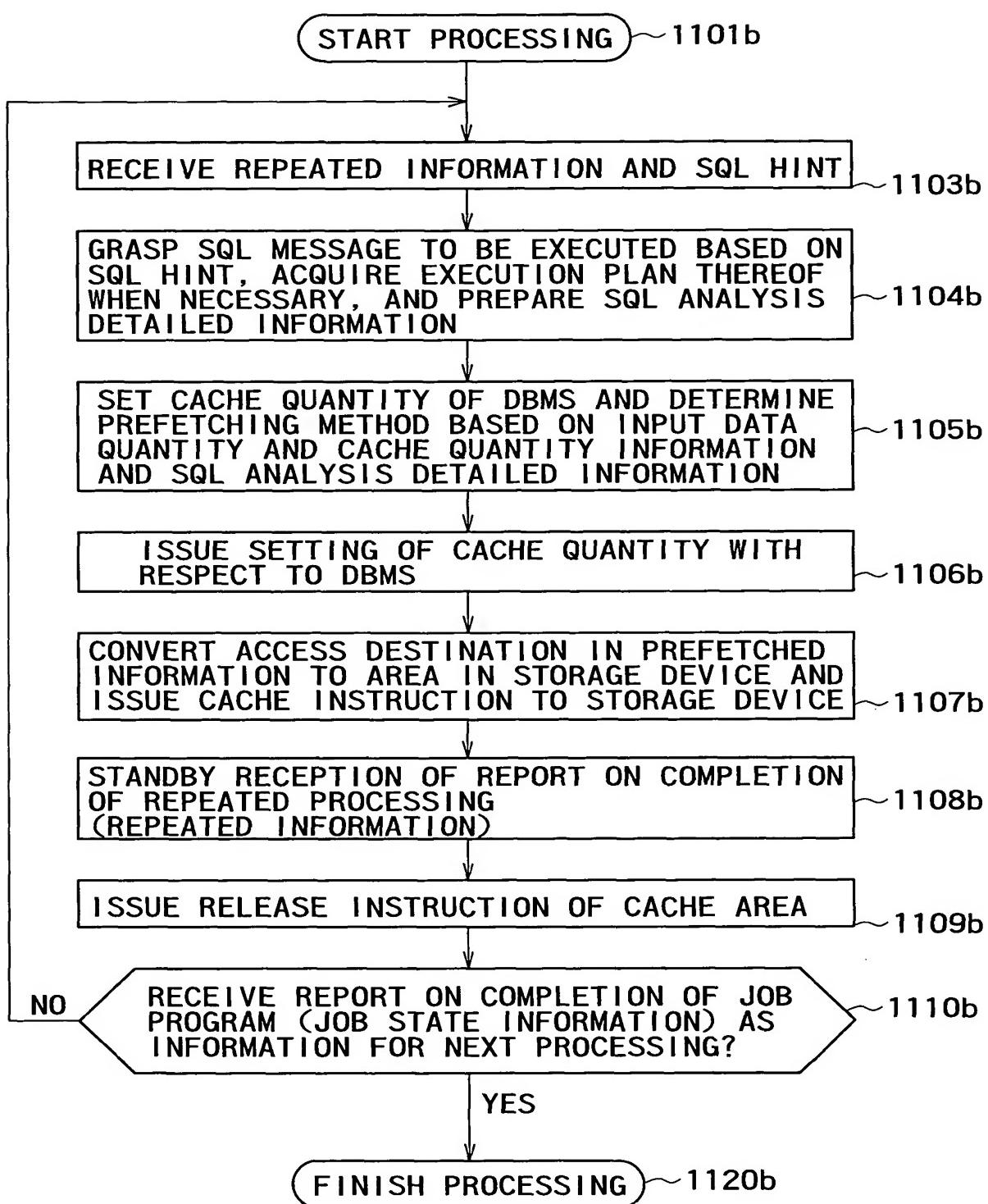
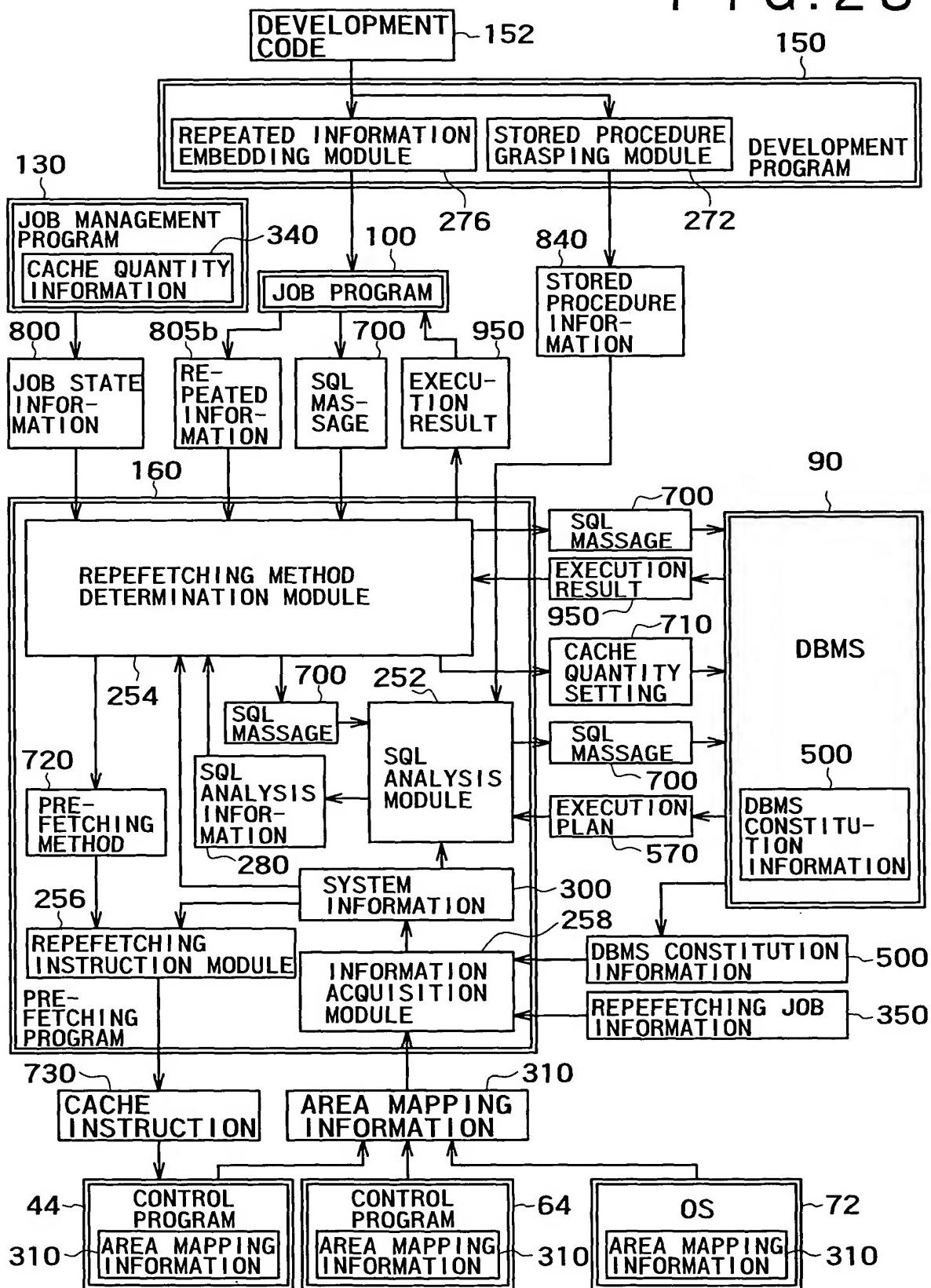


FIG. 28



## FIG. 29

5002

```

...
for(i=0; i<records; i++) {
...
name=in_name[i]; addr=in_addr[i]; pay=in_pay[i];
EXEC SQL SELECT C_ID,C_ID INTO:c_id,:c_d_id
  FROM Cust
 WHERE C_Name=:name and C_Addr=:addr
 FOR UPDATE;
EXEC SQL UPDATE Cust
  SET C_Balance=C_Balance-:pay
 WHERE C_ID=:c_id;
...
COMMIT;
}

```

REPEATED INFORMATION  
EMBEDDING PROCESSING

5024

5022

```
EXEC SQL HINT REPEAT START COUNT ;records;
```

```

for(i=0; i<records; i++) {
...
name=in_name[i]; addr=in_addr[i]; pay=in_pay[i];
EXEC SQL SELECT C_ID,C_ID INTO:c_id,:c_d_id
  FROM Cust
 WHERE C_Name=:name and C_Addr=:addr
 FOR UPDATE;
EXEC SQL UPDATE Cust
  SET C_Balance=C_Balance-:pay
 WHERE C_ID=:c_id;
...
COMMIT;
}

```

```
EXEC SQL HINT REPEAT END; ~5028
```

5002

...

## FIG. 30

```
DECLARE Tname_cursor CURSOR FOR
  SELECT name
    FROM Objects
   WHERE type=TABLE;
```

5102

```
FOREACH record IN Tname_cursor
BEGIN
  SELECT name,size
    FROM Tables
   WHERE name=record.name;
END;
```

5104

```
SELECT name,size
  FROM Tables
 WHERE name=record.name;
```

5106

REPEATED INFORMATION  
EMBEDDING PROCESSING

```
DECLARE Tname_cursor CURSOR FOR
  SELECT name
    FROM Objects
   WHERE type=TABLE;
```

5102

```
HINT REPEAT START
COUNT( SELECT count(name)
  FROM Objects
 WHERE type=TABLE );
```

5022b

```
FOREACH record IN Tname_cursor
BEGIN
  SELECT name,size
    FROM Tables
   WHERE name=record.name;
END;
```

5104

```
HINT REPEAT END; ~5028
```

FIG. 31

